Overlay Networks, Decentralized Systems, and Their Applications [BMINF004] Excercise 1 University of Zürich

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Task 1: Definitions and Characteristics

(1) An "Overlay Network" is a virtual abstracted network that is built on top of another physical network infrastructure. Examples could be: Chord (efficient search), Gnutella (decentralized filesharing), Freenet (trusted overlay), DiffServ (classification of ip pakets)

(2) An underlay network consists of the physical infrastructure of a network with directly communicating nodes, whereas an overlay network is an abstraction layer spanned over such an underlaying network. This allows a decoupling from the physical components, direct communication over several nodes and therefore a more flexible implementation.

(3) I agree. Whatsapp uses an existing physical network infrastructure and creates an overlay network by connecting you with friends to exchange messages.

Task 2: Classification of P2P systems

(1) As in a dynamic network nodes are entering and leaving continously we need a possibility to integrate newcomer nodes smoothly into the network by telling them who to contact, hence the need for "self-organization". There is no centralized server which provides this lookup. "Direct interaction" is

required because peers need to be able to communicate with other peers directly without using other nodes because they might not be part of the network.

(2) Skype is considered a hybrid P2P network because it also uses few centralized servers to help with the coordination of a phone book index, etc.

(3) NAPSTER: [Centralized Directory Model] The lookup was done over a centralized directory server.
Advantage: Lookup of existing documents can be guaranteed.
Disadvantage: Index service is a "Single Point of Failure".

GNUTELLA: [Flooded Request Model] The search request is passed on to a predetermined number of peers as there is no central coordination authority.
Advantage: No specific servers can be attacked to shutdown the system.
Disadvantage: Lookup of existing documents cannot be guaranteed. System does not scale.

BITTORRENT: [Structured Routing Model] Finding a tracker over external sites where no data is hosted. Read peer locations in trackerfile. Get data fragments from peers.
Advantage: Combines the advantages of the above mentioned systems.
Disadvantage: Self organized adaptation in the case of entering or leaving peers necessary.

Task 3: P2P Applications

(1) NAT is problematic in P2P systems because it creates a subnet which cannot be directly accessed from the WAN side. This obstructs the "direct communication" principle. A workaround being a port forwarding on the router to the desired machine which on the other hand limits peers in the subnet to one machine only.

(2) Such an accurate locality system would be useful to ISPs because they could group/cluster peers belonging to the same overlay network and guarantee a more direct and robust communication while at the same time avoiding/reducing traffic spanned over their entire network.

(3) Collecting identities of users commiting a copyright violation could be done by issuing file requests over the decentralized network and collecting the responding host identities. Considering the fact that in the P2P system mentioned you always serve as an upload node as well, I consider the P2P situation more bound to be sued than just downloading content from a C/S-System such as RapidShare for instance. This being a question of law, it probably differs by country. While generally I assume that serving illegal content is considered worse than consuming illegal content. To reduce your

chances of being sued you shall not upload at all or reduce this activity to a minimum.

Task 4: Challenge Task Preparation

(1) Completed with success according to suggested routine.